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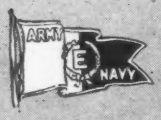

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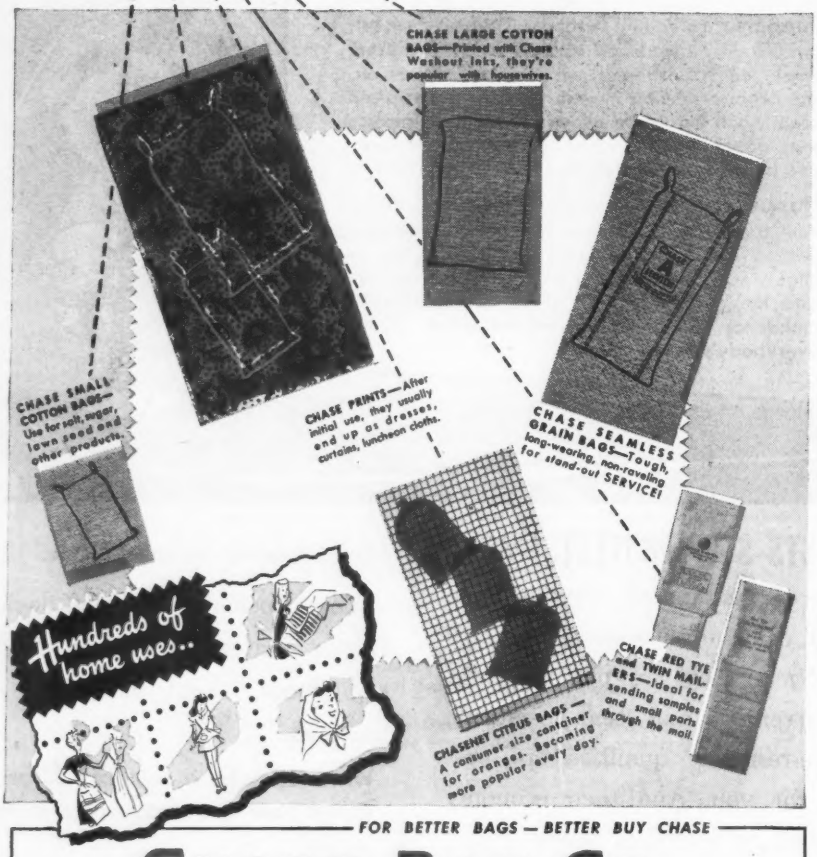
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The American FERTILIZER

Vol. 105 NOVEMBER 16, 1946 No. 10

Looking Ahead*

By WELLER NOBLE

Pacific Guano Company, Berkeley, Calif., and Chairman of the Board of Directors, National Fertilizer Association

FOR some time I have held the firm conviction that we should, without delay, review and revise our operations in preparation for a near-at-hand return to normalcy.

The September 28th *News Letter* of the Kiplinger Service contained this significant paragraph: "The easy pickings are about over. Up until approximately now, everyone could sell almost anything, and to sell it didn't take much push. But now a number of companies are seeing more signs of buyer resistance. Too-high prices and too-low quality. This shocks those who have become accustomed to easy going. Plain truth is that some companies have been spoiled by easy sales, and now they are approaching something like normalcy in competition, and they feel, without exactly saying it, that normalcy is tough."

If Kiplinger had added to the description of too-high prices and too-low quality a word on the almost non-existent Service, this paragraph would have been greatly strengthened.

Let me cite some examples to develop the thought I wish to convey: Recently I purchased a small automobile. The dealer admitted he would profit to the extent of $300 on the car turned in, and no new car is sold without the purchaser's trading in a used car. There is no question but what his normal profit would be earned on the new car, but in addition, the new car was loaded with every gadget the dealer had in stock, such as fog lights, large chrome hub-caps, automatic water spray for the windshield, seat covers, special new rear-view mirror, automatic backing light, and Polaroid driving glass; and the only reason a radio and heater were not included was that he did not have these in stock. As if the purchasing of all of these gadgets were not enough, the color available was the only color I did not want, and there was no choice but to take the car, or leave it. No comment is necessary as to what this type of selling does with public relations.

New Sales Attitude Needed

Recently in a meat market (and this is common practice) the butcher told a lady customer he was sorry that he had no meat in stock and hadn't received any for several days; conditions were tough, but that he hoped to receive a quantity in the next few days, and so-forth and so-forth. After the lady had left the store, a pet customer stepped up to the counter and asked what he had in stock, to which the butcher replied, "Well . . . lamb chops, sirloin steak, pork chops, ground round—" and almost a full list. Don't think for a minute the buying public doesn't know about such practices!

Have any of you tried to buy shoes or clothes and noted the utter lack of interest on the part of the clerks serving you? In any number of stores this indifference amounts

*An address at the California Fertilizer Association Convention, October 16, 1946.

to rudeness, or may even end in an insult. Recently in a meeting of executives in one of our large cities one of the officers made this statement, "What do you mean that we do not have a reconversion problem in our department stores? Our most immediate and pressing problem is to convert our duchesses into saleswomen."

Almost everyone knows how off-grades of wine and rum were sold to various purveyors of liquid refreshment, it being necessary to purchase these in order to get a case of standard whiskey, and this has applied even to the purchase of one bottle.

I could cite many instances in many industries which would point to the fact which I am endeavoring to place before you, namely that Service as we have known it is almost forgotten.

Some firms see the handwriting on the wall and are noticeably devoting time and energy toward correcting this situation; and they will lead the procession when, as Kiplinger says, "The going gets tough."

What of our industry? In the over-all picture, for the past four or five years (in view of the fact that the demand for fertilizers has exceeded supply) our industry has performed magnificently. Tonnage delivered to farmers in 1945 was more than double the deliveries in 1940. By and large, most demands have been reasonably well satisfied, but as so often is the case with any service industry, where orders are obtained so easily, we are likely to forget or overlook the importance of the Public Relations job which is so necessary if our position is to be maintained.

Some Constructive Suggestions

I want to mention just a few ideas that I feel we can and should act upon, and I hope you will agree, are constructive:

1. Companies are known, not by the acts of their executives, but largely by the contacts of their field representatives. Therefore, every salesman should be fully advised of current conditions; the reasons for shortages in some materials; the labor situation; shortage of machinery and materials for repair to equipment; Government requisitions of fertilizers to be sent to Europe and the Orient; and other pertinent facts that have to do with delayed deliveries. *Most important of all, however, he should be instructed to take the TIME NECESSARY to explain these conditions to his customers and this latter item all too often has been overlooked.*

2. I know of no such case, but I have heard rumors to the effect that orders have been taken for some material or grade which the seller did not expect to deliver and such orders were cancelled and substitutions made at the time of delivery. If this is being done, it should be stopped.

3. I have heard of some instances where it was intimated that the customer was requested to purchase an equal amount of another grade, in order to secure the material he desired. No one would be pleased if he were required to purchase an overcoat in order to secure a suit of clothes.

4. Due to shortages and changes made necessary by shortages of some materials, the physical condition of fertilizers is often not what it should be, and too many grades have fallen short of the guaranteed analysis. This should be remedied at the earliest possible moment.

5. I do not desire to dwell upon rumors or shortcomings of our industry, but to emphasize our obligation, which is that each one of us individually review the entire operations of his company, in view of the new order which is just around the corner. Soon we will be in a buyers' market. Last year the National Fertilizer Association established a Public Relations program which has made some progress, but which will be fully effective only if all members in our industry follow through by eliminating all practices which tend to disrupt proper relations between Seller and Buyer.

I want to conclude with a little story I recently read in Chase Bag Company's publication titled "Bagology": A beggar approached a man on the street. "Mister, I have had nothing to eat for three days . . . Will you please give me a dollar?"

"Of course not," said the man, "if you are that bad off, I should think you would be humble enough to ask for a quarter, which you, no doubt, would be more likely to receive than a dollar.'

"Give me a dollar, or give me a quarter—whichever you please," said the beggar, "but please don't tell me how to run my business."

I don't want to be misunderstood. In my discussion, I have only endeavored to emphasize the fact that the activities of any one firm affect the whole industry, for good or bad, and I hope that we will strengthen our industry by self-analysis and progressive thinking to the end that we may continue to point with pride to the type of service we render agriculture.

Acidulating Soils With Sulphur*

By ARTHUR M. SMITH

Stamford, Conn.

Sulphur, probably currently and historically the most useful reagent element in the fertilizer industry, and long known to be an essential plant food element, was relegated for many years to the status of an incidental carrier element, largely as a result of early inaccurate and misinterpreted experimental work. As late as 1930, and subsequently by many agronomists and plant nutrition chemists, sulphates in mixed fertilizers were condemned as useless filler to be eliminated whenever possible as being economically unequal in plant food value to the cost of bagging, hauling and handling. Consequently, even today the sulphur requirements of plants and soils in relation to location and climate are largely unknown, and should be the subject of further and more careful research.

It is not the purpose of this paper to discuss, or even to review, the many known uses of sulphur of service to agriculture; such as its use as a plant food element, or to control plant diseases and crop pest insects. We pass over with brief mention even such interesting subjects as the application of sulphur to soils to control potato scab by increasing soil acidity in humid regions, and its use on volcanic and other soils to supply a demonstrated plant food deficiency.

This paper is presented to focus attention on the commercially demonstrated and economically practical use of sulphur to acidulate neutral, calcareous, and alkaline soils; to enumerate what experimentally and in field practice have been shown to be some of the benefits; and to review the scope of this practice and present status of experimental work and thought in the states west of the Mississippi River. Because the published experimental work, even though not extensive, covers a period of more than twenty years, with at present little if any use of sulphur for this purpose by farmers in most of these states, it was considered advisable to send a questionnaire requesting current information (August, 1946) to each state agricultural experiment station west of the Mississippi River. The replies, certain theoretical considerations, and suggestions for further experimental work and for commercial development form the basis of this paper.

QUESTIONNAIRE

MAILED TO EACH STATE AGRICULTURAL EXPERIMENT STATION WEST OF MISSISSIPPI RIVER, AUGUST, 1946

1. Has your department conducted (or in progress) experimental work on the application of sulphur to soils for the purpose of partial, localized, or other acidulation of alkaline soils.....?
   (a) Rates of application.....?
   (b) Methods of application.....?
   (c) Time of application.....?
   (d) For what crops.....?
2. At present, do you think the application of sulphur for the purpose of acidulating neutral or alkaline soils may have practical possibilities for farming in your state if methods, rates, and times of applying are determined and demonstrated.....?
3. For crop land *not* irrigated may it be assumed that rainfall will wet applied sulphur (725 p.p.a.) sufficiently for practical oxidation during a 12 to 24 month period.....?

IN YOUR STATE:

4. Approximately what per cent of the cropped land is alkaline.....?
   pH 7.0 to 8.0.....? above pH 8.0.....?
5. Approximately what acreage of cropped land is calcareous.....?
   in surface soil.....? in subsoil.....?
6. Approximately what acreage of cropped land is alkali soil.....?
   usual pH range of irrigated soils.....?
   usual pH range of cropped land not irrigated.....?

An appreciable tonnage of sulphur is now being used by farmers to acidulate soils in six western states (Table 1), in five of which experiments on rates and methods of application are now in progress. In three other states similar experiments are in progress, and in one the purpose is to study the effect of sulphur on the intake and percolation of water. Practically no experimental work is under way, and there is no commercial usage for the purpose of soil acidulation, in the states between the Mississippi River and the Rocky Mountains with the exception of the Rio Grande Valley in Texas. Many of the soil chemists and agronomists in these states are frankly skeptical as to the practical advantage to farmers of such use of sulphur. Others, stating that large applications of sulphur per acre would probably oxidize completely to form sulphuric acid within twelve months or less, also state thay have no experimental evidence under the soil and climatic conditions of their states on which to base an opinion

*A paper presented at the meeting of the Division of Fertilizer Chemistry, The American Chemical Society, Chicago, September 11, 1946.

regarding the value to farmers of such a practice. Several think of sulphur only in terms of plant food deficiency; and for soils where this exists, they regard nearby sources of gypsum as the most economical material to use.

It should be noted here that most soils contain sufficient sulphofying bacteria to assure rapid oxidation of sulphur to sulphur trioxide (*5*);* that manure speeds up the oxidation of sulphur (*7*); that at some time during each twelve month period the surface soil in most locations is moistened sufficiently to permit sulphur oxidation (*11*); and that sulphur ground to pass a 30-mesh screen is fine enough for pracitcal field applications (*13*).

Recognizing clearly the residual acidic value from such fertilizer materials as sulphate of ammonia, ammonium phosphate, ammonium nitrate, and urea, applied separately or in mixtures, and further recognizing the probable beneficial effects from and desirability of applying sulphur in relatively small amounts per acre as a constituent material in fertilizer mixtures, the present commercial usage in certain Pacific Coast and Rocky Mountain states and in the Rio Grande Valley in Texas, and the experimental results to date indicate benefits are obtained from the separate application of sulphur to alkaline soils in amounts up to 2,000 pounds (S) per acre or more, and to calcareous soils in amounts up to 1,000 pounds (S) per acre; and that such use is economical and profitable to the farmers in the production of both agronomic and horticultural crops.

*Numbers in parenthesis refer to literature cited at end of paper.

Some Theoretical Considerations

It is well to keep in mind the very elementary consideration of the solubilities of some of the minor and trace plant food elements. The major plant food elements—nitrogen, phosphorus and potassium—may be passed over with the following considerations; All nitrates normally found in soils are water-soluble. The advantage of acidulating alkaline soils with reference to applications of ammonia are self-evident and have been demonstrated experimentally and in the field. The availability of phosphorus and of potash to crop plants does not suffer from the excess of soluble sodium salts found in black alkali soils, although both may be absorbed or combined in the solloidal, complex in calcareous soils and rendered less available.

The so-called minor and trace plant food elements, however, deserve some theoretical consideration because most of them, other than sulphur and boron, are precipitated by sodium carbonate, an ever present constituent in black alkali soils and in alkaline or "slick spots" occuring in many western states. Table II lists by groups the more important minor and trace food elements; the compositon of their sulphate salts that normally would be formed under aerobic soil conditions; and the

TABLE I

USE OF SULPHUR TO ACIDULATE SOILS ON COMMERCIAL OR EXPERIMENTAL BASIS IN SOME WESTERN STATES

State	Tonnage Sulphur Reported Used on Soils	Fertilizer Year	Soil Acidulation Experiments in 1946?	Type of Application Experiments	Crops
Texas	6,614	1944–45	Yes	Rates & Methods	Horticultural
Oregon	5,500 Total[1]	1944	Yes	Rates & Methods	Field
Arizona	5,000	1944–45	Yes	Rates & Methods	All
New Mexico	General Use[2]	1945–46	Yes	Rates & Methods	Field
California	Extensive Use[3]	1945–46	Yes	Rates & Methods	Citrus
Nevada	Recommended by Exp't Sta.[4]	1945–46	No Funds	.....	.....
Nebraska	Experimental	1945–46	Yes	Rates & Methods	All
Colorado	Experimental	1945–46	Yes	Rates & Methods	Potatoes Peaches
Wyoming	Experimental	1945–46	Yes	Percolation Tests	.....
Oklahoma	Recommended by Exp't Sta.[5]	1945–46	No	.....	Gardens

[1]Oregon: Applied to 171,000 acres including sulphur as plant food element on alfalfa.

[2]New Mexico: General practice in irrigated valleys; usual rate of application 1,500 pounds sulphur (S) per acre.

[3]California: According to W. P. Kelley, sulphur is especially effective on soils containing water-soluble carbonate and high in exchangeable sodium.

[4]Nevada: Use of sulphur on alkali soils recommended by Soils Dept. of Agricultural Experiment Station; but no data available on tonnage used.

[5]Oklahoma: Agricultural Experiment Station recommends use of sulphur on garden plots that have been irrigated with alkaline water.

The Agricultural Experiment Stations in the following states advised the author in August, 1946, that no experiments using sulphur to acidulate soils had been made or were then in progress: Washington, Montana, North Dakota, Iowa, Minnesota, Arkansas.

solubilities of these salts in cold water. A perusal of this data brings out the importance of increasing the sulphate ions in alkaline soils by partial acidulation of localized or larger soil areas or zones.

With reference to boron in alkaline soils, Table III indicates that in soils where the concentration of soluble sodium and potassium borates may be injurious, the sulphuric acid formed following applications of sulphur may tend to reduce it through formation of sodium and potassium sulphates, and consequent transfer of boron to salts of calcium and magnesium.

Benefits from Soil Acidulation

On black alkali soils, always characterized by an excess of sodium carbonates, with or without appreciable soluble potash salts and chlorides, one of the striking benefits has been the usefulness of applied sulphur in reclamation for economic cropping. This was shown by W. P. Kelley and E. E. Thomas in California in 1928 (*4*). Certain conditions such as an excess of deficiency of other elements may inhibit profitable crop yields on some types of soils thus reclaimed. According to Keeley: "Generally speaking, sulphur is especially effective where the soil contains water-soluble carbonate, particularly if the soil is relatively high in exchangeable sodium and at the same time contains calcium carbonates." (*6*).

It is generally recognized that black alkali soils can be reclaimed and farmed profitable only when sufficient water is available not only to irrigate, but also to flush these soils and wash out the excess of soluble salts, including sulphates. That applications of sulphur to alkaline soils do increase the intake and percolation of water and permit greater root penetration was shown by Fitts, Lyons and Rhoades working experimentally on "slick spots" of Laurel very fine sandy loam in Nebraska (*1*). They state: "Sulphur was more effective than gypsum or calcium chloride except for a short time following application" in increasing water intake. Also, "alfalfa roots did not penetrate below a depth of 9 inches in the untreated, clacium chloride, or gypsum treated plots, although a vigorous growth of lateral roots occurred in the treated plots. Roots in the sulphur treated plots penetrated to coarse sand at a depth of 40 inches." The rates of application of sulphur (S) were 2,000 and 6,000 pounds per acre. This suggests the possibility that long term experiments might show applications of sulphur incorporated in the surface soil would change the soil structure sufficiently to enhance the intake and penetration of rain water and thereby benefit dry farming operations.

Replies from soil chemists and agronomists in the states between the Rocky Mountains and the Mississippi River indicate a general opinion that, although acidulation of alkali soils with sulphur may be economically practical, it holds little advantage with reference to the calcerous soils so prevalent in that region. According to H. L. Walster, Director of the North Dakota Agricultural Experiment Station, all of the subsoils and many of the surface soils in that state are calcareous (*14*). However, it is on calcereous soils that practically all of the 6,614 tons sulphur (S) reported for Texas in the 1944-45 season was used. J. F. Fudge states: "Considerable quantities of sulphur are being used in the

(Continued on page 26)

TABLE III

SOLUBILITY OF CERTAIN BORATES

Boron Salt	Parts Soluble in 100 parts cold water*
$K_2B_4O_7.5H_2O$	26.7 @ 30°
$Na_2B_4O_7.10H_2O$	5.6 @ 20°
$Ca(BO_2)_2.2H_2O$	0.40 @ 30°
$Mg(BO_2)_2.8H_2O$	Insoluble

*From Van Nostrands Chemical Annual, 6th issue.

TABLE II

SOLUBILITIES OF SULPHATE SALTS OF SOME MINOR AND TRACE PLANT FOOD ELEMENTS

Group	Element	Precipitated by Na_2CO_3?	Sulphate Salt	Parts Soluble in 100 parts cold water*
Acidic Elements	Sulphur	No	R– SO_4	mostly soluble
	Boron	No	R– B_4O_7	Na & K salts sol.
Metallic Elements	Copper (ic)	Yes	$CuSO_4.5H_2O$	32.96 @ 20°
	Iron (ic)	Yes	$Fe(SO_4)_3.9H_2O$	v. sol.
	Manganese (ic)	Yes	$Mn_2(SO_4)_3$	deliques.
	Cobalt (ic)	Yes	$Co_2(SO_4)_3$	sol. with dec.
	Zinc	Yes	$ZnSO_4.6H_2O$	123 @ 0°
	Calcium	Yes	$CaSO_4.2H_2O$	0.223 @ 0°
	Magnesium	Yes	$MgSO_4.7H_2O$	76.9 @ 0_2°

*From Van Nostrands Chemical Annual, 6th issue.

California Fertilizer Problems*

By MAURICE H. LOCKWOOD
President, the National Fertilizer Association

CALIFORNIA and the Western States in general have increased their use of fertilizers greatly in recent years. How far that increase in volume and in what ratio for the major nutrients the trend might have been we do not know, for demand has exceeded supply for several years. With fruit, nuts, canning and truck crops taking a large part of the plant food, nitrogen has been your chief nutrient element, accounting for half or more of the volume of the three which we think of first in most fertilizer practice. Phosphoric acid and potash have trailed along in second and third place, respectively.

During the few years ahead we in the fertilizer industry here on the West Coast will share with the agricultural authorities in the area the important responsibility of guiding fertilizer use soundly. This post-war period of readjustment offers a challenge to our business judgment which we shall not take lightly. First, how much fertilizer should be and will be used? Secondly, and fully as important, of what is it to be made up? Third, and not least, who is going to supply it? Private enterprise or government?

The question of how much fertilizer should be and will be used will not be determined completely by agricultural income, although historically that factor has been the principal one related to dollars spent for fertilizers. There will obviously be some readjustment in fertilizer used for particular crops during the coming one to three years, and perhaps more after that period. But we may well remember that with the step-up in perishable food preservation some of our older standards of food handling have been substantially altered, resulting in both an improved variety and quality of national diet, and changed bases for agricultural supply consumption.

New Standards

We may also well remind ourselves that in few, if any, of the years since 1940 have we had a balanced supply and demand for fertilizers. Therefore the usual guides for quantity and place have been lacking, except that most of us know that some demand has gone unsatisfied. Channels of distribution, too, have been temporarily restricted by emergency regulation such as allocations by government agencies.

Now that the war emergency is behind us, we may look forward to the time when the effective checks and balances of business operating without emergency government restriction will furnish us with more stable guides in this as well as other industries. In fact it is our responsibility to see to it that such emergency restrictions are not transferred from war-agencies to other permanent bureaus where some willing hands would readily grasp and too willingly continue the authority over business economy. While none of us should expect the post-war free economy to be the same as it was in the pre-war period, the sound principles of competitive business are certainly preferable to an economy planned by social reform enthusiasts unrestrained by the sobering influences of payrolls met from incomes, and of active minds which promptly bury obsolete competitors.

Under such a system of restored guides we may well expect new heights of fertilizer use. How high they will prove to be will depend upon not only the factor of agricultural income, but upon the management ability of millions of users. That management ability depends largely on the happy combination of technical knowledge and the sense with which to put it at work. I shall not attempt to set your sights on such goals, although I trust we all can and will aim sensibly upward.

What Kind of Fertilizers?

In the field of fertilizer technology there are several spheres where research specialists of public institutions and industry may well work together. Some of these spheres are (1) chemical engineering, (2) analytical chemistry, (3) soil chemistry, and (4) plant physiology. Much fundamental research has been and still should be carried on as a foundation for sound fertilizer use. A large share of such research falls upon our public research agencies. Industry may well lend its moral and financial aid to such research agencies. In fact, our industry already is doing just that, and is expanding such support.

*Address before the 23rd Annual Meeting of the California Fertilizer Association, Beverly Hills, Calif., October 16, 1946.

In the fields of analytical chemistry, too, there is in general a fine spirit of cooperation between most of our industry and the control officials. The chemical control committee of the National Fertilizer Association serves as a constructive agency in these relations and as you may know, has for the past nine months employed Dr. William H. Ross as a consultant. His work on a project concerning nitrogen analysis for one of the newer materials has already been an aid to industry and some of the control laboratories. Other projects are under way.

An effort to overlap or displace the state control laboratories' functions with Federal fertilizer control legislation has been made at least twice in recent years by the introduction into Congress of proposed laws. The National Fertilizer Association has gone on record as opposing such unnecessary duplication of controls, and will vigorously oppose bills proposing such laws should they reach either hearing or legislative action stages.

In the field of chemical engineering, both for the production of fertilizer materials and mixtures, our industry gladly works in harmony with research agencies of government and other institutions. When government agencies reach beyond their sound sphere of research and referee, however, we oppose such steps consistently.

In the sphere of applied research we seek as an industry the aid and cooperation of public agencies. The resident teaching staffs as well as the extension services in most cases freely exchange information with members of the fertilizer industry. There is still room for improvement in such relations, however, and there is no substitute which we have found for just such collaborative programs as you are having here this week.

Let us seek fundamental research first, with use of and results from fertilizers last. Also let us have the resident teaching staffs of schools and universities shaping each year's crop of minds for the problems ahead. Let us count also on the extension specialists, the county agricultural agents, and last but not least, the fertilizer fieldmen necessarily answering the users' questions of what and how much, and why.

Which prompts me to raise the question for you to answer of *why* your mineral fertilizer use record in California is so low in relation to your nitrogen use? And *what* should it be as we look ahead?

Who?

Such threatening legislation as the Hill-Bankhead-Flannagan Bills introduced during the 79th Congress will probably be reintroduced in the 80th Congress which is scheduled to convene early in January.

How may industry soundly combat such threats?

First, by filling the nation's needs for fertilizers.

Second, by presenting facts concerning our industry constructively.

Third, by individually contacting members of the Congress, both now while they are at home and later when hearing or active legislative stages develop, pointing out the advantages of competitive free enterprise over the stifling effect of government intrusion in the fields of production and distribution.

In our current tour of the Northwest and the West Coast, Fred Lodge and I are finding new materials production developments and enlargements of those already established, which promise to create much more self-sufficiency of the West in phosphates. With the large phosphate resources of the inter-mountain area, and the low cost hydro-electric power available, this is certainly a sound trend.

During the next few years we will find the other nutrients balancing demand with supply, too. And new materials, including some of higher analysis, will come into recognized use.

CALIFORNIA

TONS OF THE THREE MAJOR NUTRIENTS

	5-Year Average 1935–39	1940	1941	1942	1943	1944	1944–45
Nitrogen	26,007	29,194	38,882	26,802	46,294	62,458	58,243
Phosphoric Acid	14,069	17,902	21,036	23,287	23,442	34,477	42,480
Potash	6,034	5,852	7,342	8,914	10,806	9,778	16,056
Total	46,110	52,948	67,260	59,003	80,542	106,713	116,779
Ratio N	56	55	58	45	58	59	50
P_2O_5	31	34	31	40	29	32	36
K_2O	13	11	11	15	13	9	14
Nutrient Volume Index	100	115	146	128	175	231	253

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An End and a Beginning

With the general decontrol of prices by OPA on November 11th, another important period in the history of the fertilizer industry has come to an end. Once more the manufacturer can decide for himself what grades he will offer his customers (except in States which by law have established official grades), and what prices he will charge for his products.

The story of wartime fertilizer production is one in which the industry can take great pride. Faced with acute problems of material supply, labor shortage and transportation difficulties, the fertilizer manufacturers showed the country what can be done by intelligent cooperative effort. From a 1939 output of 7,590,000 tons, the industry advanced steadily to a figure of 13,201,000 tons in 1945, an increase of 77 per cent. In tonnage of plant food, the increase was 122 per cent, whereas average fertilizer prices rose only 21 per cent during that period. A truly great record of a truly great industry.

And now, with the lifting of controls, the industry faces truly great responsibilities. During the war, the number of grades was limited by governmental action, and experience proved that this standardization provided adequate plant food for all crops and at the same time promoted manufacturing efficiency. Will fertilizer manufacturers in those states without grade limitations continue this intelligent program, or will there be a return to the multitudinous list of grades which were prevalent before the war? The model state fertilizer law proposed by the control officials provides for an official list of grades to be adopted by each state. This should have the backing of every manufacturer.

In the matter of prices for the coming season, the industry now has a chance to strike a decisive blow against the threat of government competition. Its war price record is the best of any business that sells principally to the farmer. If the manufacturer of fertilizer will take the long viewpoint and keep any price increases at a justifiable minimum, he will be building solidly for the future, and the advocates of a socialized fertilizer industry will be deprived of their main talking point.

As we stand at the beginning of an era of greater opportunities for service to agriculture and of sound prosperity to the industry, we can say, "Hats off to the past! Coats off to the future!"

National Crop Goals Announced

Potatoes

The U. S. Department of Agriculture has announced the establishment of a 2,669,800-acre national potato goal for 1947. This is 116,000 acres below the acreage planted in 1946. The goal is slightly above that suggested to states early in September as a result of revisions following a review by federal and state agricultural agencies. This goal acreage, Department officials estimated, should produce under average conditions approximately a 375 million-bushel crop.

Increased yield per acre has increased total production of potatoes in recent years. Increased and more efficient use of irrigation and fertilizers, plus adoption by growers of newly developed insecticides, have increased yields per acre. Smaller requirements for military needs and curtailed requirements for dehydration indicate less total potato production will be required in 1947.

The national acreage goal has been broken down to state goals which have been arrived at after a study of recommendations by State USDA Councils. Goals for individual farms will be established by County Agricultural Conservation Committees.

Only growers who plant within their acreage goals will be eligible for price support under the Department's 1947 price support program for potatoes, Department officials said.

Rye

The national goal for rye acreage to be harvested for grain in 1947 is 2,374,000 acres, or 134 per cent of the indicated 1946 harvested acreage—a total that is considered necessary to meet requirements for human food and livestock feeding. October 1, 1946 stocks of rye on farms and in commercial channels totaled only 14.8 million bushels compared with 22.3 million on October 1, 1945, and with 36 million bushels on October 1, 1944.

Sugar Beets and Cane

The 1947 goal for sugar beets is 1,069,000 acres, which is 115 per cent of the 1946 planted acreage. For sugar cane the goal is 327,000 acres, or 109 per cent of the 1946 harvested acreage. Sugar from these crops will be available beginning in late autumn of 1947.

Dry Peas and Cover Crop Seeds

The 1947 goal for dry peas has been dropped to 478,000 acres, as compared with 512,000 planted in 1946. Goals for various cover crop seeds have been set as follows: Austrian winter peas, 66,000 acres (42,000 acres in 1946); crimson clover, 90,000 acres (61,800 acres in 1946); hairy vetch, 88,000 acres (49,900 acres in 1946); common and Williamette vetch 90,000 acres (112,500 acres in 1946); common ryegrass, 80,000 acres (98,000 in 1946).

Morgantown Ammonia Plant in Production

The Heyden Chemical Corporation reports that production of anhydrous ammonia at the Morgantown, W. Va., Ordinance Works is now under way. In less than 3 months, a force of more than 900 men has transferred the plant from a standby to an operating status. Production will be increased steadily until plant capacity is reached.

All of the ammonia produced will be used in the Government fertilizer export program and the Morgantown plant is expected to turn out more than half the anhydrous ammonia used for this purpose. The Heyden Company is operating the plant for the Army Ordinance Department.

September Sulphate of Ammonia

Production of by-product sulphate of ammonia during September continued at about the top limit of present manufacturing facilities, according to the U. S. Bureau of Mines. The month's output was 64,142 tons, a drop of only 900 tons from the August figures. Shipments declined, however from 73,106 tons in August to 61,768 tons in September. This is due entirely to lack of transportation facilities as production has been sold in advance and fertilizer companies are taking deliveries as fast as producers can ship. Stocks on hand at the end of September totaled 40,845 tons, which represents about 19 days' production.

	Sulphate of Ammonia Tons	Ammonia Liquor Tons NH_3
Production		
September, 1946	64,142	2,240
August, 1946	65,251	2,237
September, 1945	62,731	2,267
January-September, 1946	460,757	18,026
January-September, 1945	591,636	21,076
Sales		
September, 1946	61,768	1,929
August, 1946	73,106	2,079
September, 1945	64,904	1,908
Stocks on Hand		
September 30, 1946	40,845	907
August 31, 1946	38,609	733
September 30, 1945	26,402	1,028

November Cotton Report

An 8,487,000 bale cotton crop for the United States is forecast this year by the Crop Reporting Board of the Bureau of Agricultural Economics, based on information reported by farmers and ginners as of November 1. This is a reduction of 2.7 per cent or 237,000 bales from the October 1 forecast. The indicated 1946 crop is approximately 525,000 bales less than the 9,015,000 bales produced in 1945 and nearly 4,100.000 bales less than the 10-year average. It is only 542,000 bales larger than the 1921 crop of 7,945,000 bales which is the smallest crop since 1895.

The lint yield per acre, computed at 229.2 pounds, is 21.8 pounds below that harvested last year and 14.0 pounds below the 10-year average, and compares with the 1944 record of 293.5 pounds.

With favorable harvest weather and more labor available than in recent years, packing and ginning made rapid progress during October in all States except Texas. In that State, frequent rains and wet fields seriously interfered with harvesting the crop and caused some loss of cotton.

The Bureau of the Census reports 5,724,926 bales of cotton ginned from the crop of 1946 prior to November 1, compared with 5,151,873 bales for 1945 and 8,282,768 bales for 1944.

500 lb. gross wt. bales

State	Average 1935-1944	1945 Crop	1946 crop indicated Nov. 1
	1,000 bales	1,000 bales	1,000 bales
Missouri	365	180	280
Virginia	27	16	18
North Carolina	612	428	470
South Carolina	773	664	725
Georgia	956	669	570
Florida	22	8	5
Tennessee	514	466	490
Alabama	1,016	931	780
Mississippi	1,757	1,560	1,020
Arkansas	1,375	1,042	1,185
Louisiana	656	387	250
Oklahoma	596	285	260
Texas	3,137	1,794	1,700
New Mexico	112	106	128
Arizona	187	117	143
California	430	353	450
All Other	18	9	13
United States	12,553	9,015	8,487
Amer. Egypt	33.6	4.1	2.0

Obituary

A. C. Carpenter

A. C. Carpenter, Director and former Vice-President of the Bemis Bro. Bag Co., St. Louis, died on November 5th, at the age of 77. He had been associated with the Bemis Company for fifty years and for thirty-five years held important executive positions.

Mr. Carpenter came up from the ranks having been foreman, superintendent, and manager of the Bemis plant at New Orleans. In 1920 he was made manager of the Bemis plant at St. Louis, and at the same time was elected a Director of the Company. In 1923 he was made Vice-President and in 1942 First Vice-President.

Early this year Mr. Carpenter retired from many of his active duties but remained as a Senior Counselor and Director of the Company, retaining his office at the Bemis headquarters in St. Louis.

Mr. Carpenter was a Director of the Mississippi Valley Trust Co. of St. Louis, the Frisco Railroad, and the W. N. Matthews Corp. He participated in many civic affairs and was one of the leaders in the community.

BRADLEY & BAKER

FERTILIZER MATERIALS - FEEDSTUFFS

AGENTS - IMPORTERS - BROKERS

155 E. 44th Street
NEW YORK

BRANCHES

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Baltimore, Md.

505 Royster Building
Norfolk, Va.

Barnett Bank Building
Jacksonville, Fla.

504 Merchants Exchange Bldg., St. Louis, Mo.

FERTILIZER MATERIALS MARKET

NEW YORK

Demand for All Materials Heavy with Slight Changes in Price Structure. Shortage of Cars Hampers Phosphate Rock and Sulphate of Ammonia Shipments. New Superphosphate Plants Taking All Available Rock Supplies.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, November 8, 1946.

Demand in all fertilizer raw materials continues considerably in excess of supply. Forward sales are heavy and inventories are relatively light. In spite of this general condition within the industry, the price structure to date has not been materially changed. There is a slight trend upward but the change is immaterial insofar as the overall picture is concerned.

An exception to the general price structure as regards chemical ingredients is the relatively high price paid for a few small importations of organic nitrogen materials.

Phosphate Rock

Still in short supply, and added to the problem of increasing production at the source because of the slowness in receiving equipment is continuing shortage of necessary cars, which has resulted in some backing up of inventories at producing points. Price structure remains set.

Superphosphate

Regular grades of this material are still insufficient to meet heavy demands. One trouble is the difficulty in securing rock in quantities needed and the enrty of many new producers, particularly in the Midwest, has aggravated the supply situation.

Potash

Stocks at producing points have been considerably increased because of the inability of the various companies to secure needed box cars. Government allocations to new producers have now been made and practically all such tonnage has now been placed. Supply of all potash salts is still short of meeting domestic demands.

Sulphate of Ammonia

Production has held up well and is moving out of plants just as fast as cars are available. There has been a great deal of inquiry for the export field, but with domestic demands in excess of supplies it has been impossible to supply that need.

Organics

This market remains extremely tight. Such material that is offered is being taken up immediately by the feed trade in all instances where the organic involved is suitable for feeding purposes. Minor importations of bone meals, goat manure and so forth have commanded prices considerably higher than the prices of similar domestic materials.

CHARLESTON

Organics Prices Soar Out of Fertilizer Range. Car Shortage Hinders Delivery of Many Materials. Little Spot Material on Market

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, November 7, 1946.

Free market on most organics has placed many out of reach of fertilizer manufacturers as regards price. Basic materials such as phosphate rock, superphosphate, sulphuric acid, potash remain short in supply relative to the great demand.

Packing-house organic materials have increased sharply in price with lifting of OPA controls. Cotton seed meal also has advanced considerably with prices of $95.00 to $100.00 being asked. South American blood is quoted at around $9.75 per unit c.i.f., of ammonia ($11.85 per unit N), Atlantic and Gulf ports and slightly higher c.i.f. West Coast ports. Domestic blood is quoted nominally at $10.00 ($12.15 per unit N) f.o.b. Chicago, but few, if any, fertilizer manufacturers will pay the price. European organics remain practically unobtainable.

Bone Meals.—Domestic steamed bone meal, 1 and 65 per cent quoted $75.00 to $80.00 per ton, basis Chicago. Raw bone meal, 4½ and 45 per cent, in bags, quoted nominally at $39.50 f.o.b. Chicago.

Tankage.—Wet rendered tankage prices are at $10.00 to $10.50, with few offerings of material.

Fish Meal and Scrap.—Price picture has been confused by OPA increases and then decontrol of prices completely. Supply remains behind demand particularly on fish meal.

Nitrate of Soda.—Increasing demand for agricultural use tightens the supply situation. Shortage of soda ash continues to hamper domestic production and imports fail to catch up with the demand.

Sulphate of Ammonia.—Production is ahead of this time last year, but movement is mainly against existing contracts. Demand remains constant and greater than supply.

Superphosphate.—Slightly increased supply during August, but general supply situation remains well below demand.

Phosphate Rock.—This article remains short in supply in relation to the tremendous demand. Car shortage in general and particularly at the mines has hampered deliveries of rock to superphosphate producers up to 40 per cent of their orders.

Castor Pomace.—Nothing being offered, and producers are mainly concerned with cleaning up existing contracts.

PHILADELPHIA

Demand Still Far Exceeds Supply. Organics Offered at Greatly Increased Prices. Most Material Shipments on Contracts.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, November 9, 1946.

The demand still continues for raw materials and mixed fertilizers, with ability to supply still limited. Offerings of fish scrap and organic by-products are in the market, but the volume seems larger than it actually is, due to multiple tenders of the same stuff.

Sulphate of Ammonia.—Shipments are moving on contracts, with no accumulation of stocks possible. The market position is stronger and the export demand is particularly active.

Nitrate of Soda.—Position is practically unchanged. Demand continues active, while the domestic production is still limited.

Castor Pomace.—Shipments moving on contracts, with only very limited new business offered.

Blood, Tankage, Bone.—Offerings are now appearing on the market but there is no great rush to buy. Quotations have been reported at $9.50 to $10.50 per unit of ammonia ($11.55 to $12.76 per unit N) for blood and tankage, and $70.00 to $80.00 per ton for raw bone meal. Steamed bone meal has been quoted variously at $65.00

CASE HISTORY No. 10

One in a series of factual experiences of a group of American manufacturers with Multiwall Paper Bags.

COST COMPARISON
(Per Ton)

	Burlap Bags	Paper Bags
Container cost	$2.18	$1.70
Labor cost	.55½	.30½
Total bag and labor cost	$2.73½	$2.00½
Saving, paper over fabric		73¢

CLASS OF PRODUCT PACKED

CEMENT	FERTILIZER ✔
CHEMICALS	FOOD
FEEDSTUFFS	MISCELLANEOUS

PRODUCT CHARACTERISTICS

ABRASIVE	GRANULAR ✔
CORROSIVE	HEAVY
DELIQUESCENT	HYGROSCOPIC ✔
FLUFFY	LIGHT
FREE-FLOWING	VISCOUS

ST. REGIS BAG PACKAGING SYSTEMS are made in a variety of capacities, speeds, and manpower requirements to suit specific products and plant layouts. Machines are available in types to meet the special characteristics of a wide range of products, with filling speeds as high as twenty-four 100-lb. bags per minute — with one operator.

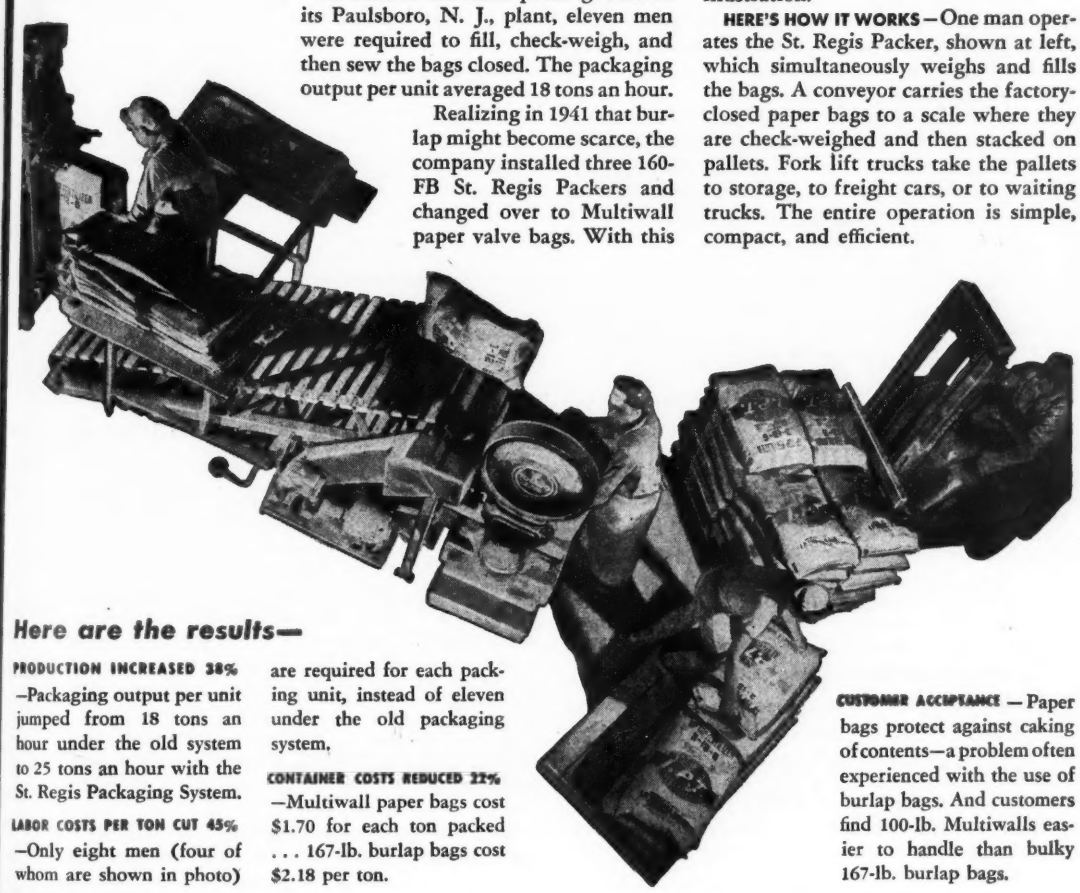
BIRDS EYE VIEW OF PACKAGING EFFICIENCY

Up to 1940, I. P. Thomas and Sons Co., of Camden, N. J., packed its mixed fertilizers in 167-lb. open mouth burlap bags.

At each of the three packing units in its Paulsboro, N. J., plant, eleven men were required to fill, check-weigh, and then sew the bags closed. The packaging output per unit averaged 18 tons an hour.

Realizing in 1941 that burlap might become scarce, the company installed three 160-FB St. Regis Packers and changed over to Multiwall paper valve bags. With this equipment as a basis, the company put into operation the highly efficient St. Regis Packaging System shown in the illustration.

HERE'S HOW IT WORKS—One man operates the St. Regis Packer, shown at left, which simultaneously weighs and fills the bags. A conveyor carries the factory-closed paper bags to a scale where they are check-weighed and then stacked on pallets. Fork lift trucks take the pallets to storage, to freight cars, or to waiting trucks. The entire operation is simple, compact, and efficient.



Here are the results—

PRODUCTION INCREASED 38% —Packaging output per unit jumped from 18 tons an hour under the old system to 25 tons an hour with the St. Regis Packaging System.

LABOR COSTS PER TON CUT 45% —Only eight men (four of whom are shown in photo) are required for each packing unit, instead of eleven under the old packaging system.

CONTAINER COSTS REDUCED 22% —Multiwall paper bags cost $1.70 for each ton packed . . . 167-lb. burlap bags cost $2.18 per ton.

CUSTOMER ACCEPTANCE — Paper bags protect against caking of contents—a problem often experienced with the use of burlap bags. And customers find 100-lb. Multiwalls easier to handle than bulky 167-lb. burlap bags.

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Without obligation, please send me full details regarding "Case History" No. 10, outlined above.

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to $80.00. All these articles go mostly to the feeding trade.

Fish Scrap.—There have been offerings from several directions—some of them undoubtedly duplicated. Prices mentioned have been from $125.00 to $160.00 per ton for meal, and while this is now entirely feeding material, there is no great buying rush at the moment. Fishing is said to be about over in Chesapeake Bay and the northern Atlantic coast, with the fleet still operating off Florida.

Phosphate Rock.—Market position is still strong, and the demand, both domestic and foreign is greater than can be supplied.

Superphosphate.—Inquiry is active and shipments are moving on contracts. Little new business is reported.

Potash.—Demand continues, with deliveries under government regulation and not a few mixers short of their requirements. The production in Europe is increasing.

CHICAGO

Offerings of Fertilizer Organics Still Scarce. Feed Materials Advance in Price.

Exclusive Correspondence to "The American Fertilizer"

Decontrol on various ingredients has had no bearing on the organic market, and offerings are as scarce as ever, notwithstanding heavy livestock receipts.

In feeds, OPA decontrol resulted in wet rendered tankage and dried blood prices advancing to $10.00 and over per unit ammonia ($12.15 per unit N), while dry rendered tankage sold at $2.10 and higher per unit protein f.o.b. producing points. Offerings, however, are limited.

Torrence Elected President of Link-Belt Co.

George P. Torrence, executive vice-president of Link-Belt Company since July 1, 1946, became president of the company, effective November 1st, succeeding William C. Carter.

In his 25 years with Link-Belt, Mr. Torrence served in various capacities beginning as draftsman. He was manager of the Indianapolis operations from 1926 to 1932 and president from 1932 to 1936.

Mr. Carter, who had been president since December, 1942, has retired from this position in accordance with the company's retirement plan. He continues as a director of the company and as chairman of the executive committee of the Board.

Mr. Torrence has persuaded Mr. Carter to serve the company as a consultant, which will give the organization the benefit of Mr. Carter's long experience, especially needed during this period.

Changes in Du Pont Ammonia Sales Staff

The Du Pont Company announced a series of personnel changes in the Sales Division of the Ammonia Department.

E. A. Hedin has asked to be released as sales manager of the Nitrogen Products Section, and J. H. Daughtridge, who has been sales manager of the Special Products Section, will succeed him. Mr. Hedin has been in ill health for some time and has been on leave from his position for months.

J. R. Williams, who has been assistant sales manager of the Special Products Section, will succeed Mr. Daughtridge as sales manager there.

Dr. W. W. Beck has been appointed manager of the Technical Service Section, suc-

Manufacturers' Sales Agents for **DOMESTIC**

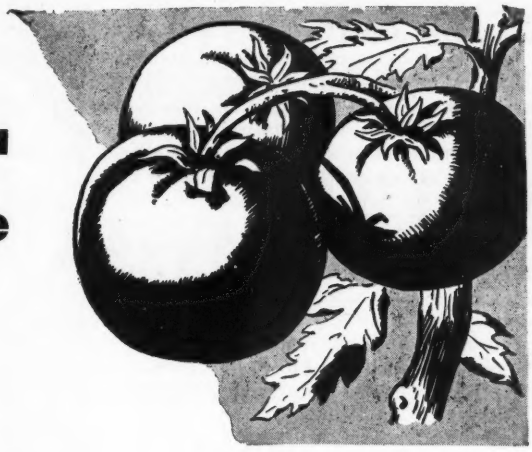
Sulphate of Ammonia

Ammonia Liquor :: Anhydrous Ammonia

HYDROCARBON PRODUCTS CO., INC.

500 Fifth Avenue, New York

Tomatoes have a growing appetite for nitrogen

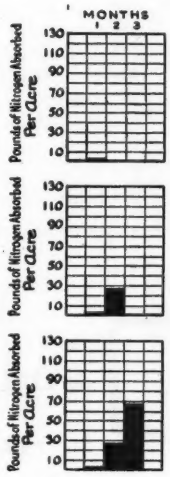


IN NEW JERSEY

During the 1st month, tomatoes absorb only about 3% of the total nitrogen they're going to need, according to New Jersey experiments.

In the 2nd month, the tomato plants begin to take hold. Still they use less than one-third of the nitrogen required for full growth.

But in the 3rd month, the tomato plants take up more than two-thirds of the nitrogen required for full growth and maturity.



Conclusion—Tomatoes need a nitrogen fertilizer that resists leaching for more than two months and then is ready to be taken up in large quantities during the last month before harvest.

Your fertilizer fits the crop when you use Urea Nitrogen

Urea nitrogen is completely available to plants, but is resistant to leaching owing to chemical reactions which take place in the soil. As a result, the nitrogen is available when required late in the growing season.

Du Pont UREA-AMMONIA LIQUORS provide an excellent source of urea nitrogen. They're low in cost, easy to handle, and produce quick-curing mixtures that store well and drill well. They also have a low acid reaction in the soil.

To meet the varying requirements of manufacturers, Du Pont supplies four UREA-AMMONIA LIQUORS and URAMON Fertilizer Compound. For additional information, write E. I. du Pont de Nemours & Co. (Inc.), Ammonia Department, Wilmington 98, Del.

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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

ceeding Dr. H. R. Dittmar who recently became assistant director of sales of the Ammonia Department.

At the same time, it was announced that J. B. S. Holmes, who resigned September 1 as assistant sales manager of the Nitrogen Products Section, is leaving Du Pont December 1 to take his new position as vice-president in charge of sales with the Beadenkopf Leather Company, of Wilmington.

Mr. Hedin, 54 years old and a native of Norway, came to the United States soon after being graduated from the Christiana Technical College with a degree in chemical engineering. He had extensive experience in paper production and construction of paper mills before he joined the Du Pont Company as a research chemist at the Experimental Station, Wilmington, in 1919.

He left Du Pont to become general superintendent of the Keystone Paper Manufacturing Company, Upper Darby, Pa., a position he held for two years.

Rejoining Du Pont, he again took up research duties and then shifted to sales work in 1930. He has been sales manager of the Nitrogen Products Section since 1944.

Mr. Daughtridge, 36 years old, is a native of Tarboro, N. C., and has been with Du Pont for 16 years. He was graduated from The Citadel, Charleston, S. C., with a bachelor of science degree in chemistry in 1930 and joined the Du Pont Company soon afterward.

A native of Richmond, Va., Mr. Williams has been with Du Pont since 1934, starting as a junior chemical engineer soon after he was graduated from the University of Virginia.

Dr. Beck, who is 32 years old, has been with the Du Pont Company since he received his Ph.D. degree in organic chemistry at the University of Nebraska. He also studied chemical engineering at Alabama Polytechnic Institute, being graduated with a bachelor of science degree there in 1934. During World War II, he was loaned for several months to the National Defense Research Committee for special work.

September Superphosphate Figures

Output of superphosphate increased 3.4 per cent over August, and 11 per cent over September, 1945, according to the Bureau of Census figures. Total production (basis 18 per cent A. P. A.) was 721,475 tons. Shipments increased slightly to 738,876 tons while the stocks on hand at the end of September dropped a few thousand tons to 706,876 tons.

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See page 25

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Normal superphosphate production increased slightly, as well as the amount shipped to mixers and used in producing plants, stocks on hand at the end of the month were 30 per cent under those of a year ago.

Concentrated superphosphate production is about 30 per cent above that of September, 1945, and stocks on hand have increased to over 48,000 tons.

Due to the scarcity of raw materials, only 2,363 tons of wet-base goods were produced but a drop in shipments increased stocks on hand to 8,189 tons.

	Normal 18%	Concentrated 45%	Base Goods 18%
Production	Tons	Tons	Tons
Sept., 1946	642,002	30,844	2,362
Aug., 1946	621,941	28,730	3,852
Sept., 1945	587,428	23,694	4,477
Shipments and Used in Producing Plants			
Sept., 1946	664,433	29,208	1,423
Aug., 1946	649,295	31,552	1,440
Sept., 1945	589,585	18,731	2,026
Stocks on Hand			
Sept. 30, 1946	576,642	48,818	8,189
Aug. 31, 1946	591,059	46,507	7,249
Sept. 30, 1945	827,856	31,593	7,308

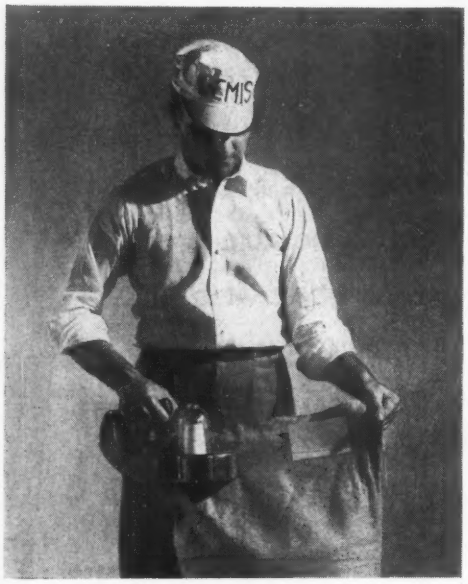
Richardson Bag Closer Again Available

Richardson Scale Company, Clifton, New Jersey, announces reestablishment of their Richardson Bag Closer production lines, which were discontinued because of material shortages during the war. Again they have appointed the Bemis Bro. Bag Co., with its many strategically located branches and sales offices throughout the country, as exclusive distributor of this 100% portable machine.

No motor or electric power is necessary in operating the Richardson Bag Closer—it functions on a friction drive. As the Richardson Bag Closer is drawn across the bag, friction rollers rotate on double-row, felt-sealed ball bearings, which require no lubrication, and transmit power to the needle through a train of gears operating on oilless bearings.

The case is sturdy but light in weight—the complete machine weighs only eight pounds —and is made as an aluminum die casting with a highly polished mirror-finish which prevents the collection of dust.

At present, the Bemis organization is offering the Richardson Bag Closer at the same price that applied formerly. They report a heavy demand and ability to make prompt shipment.



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See Page 20

ACIDULATING SOILS WITH SULPHUR

(Continued from page 11)

Rio Grande Valley for the purpose of acidulating local areas of calcareous soils. These soils are definitely not alkali soils but are simply high in their content of calcium carbonate. Very little sulphur is being used elsewhere in the state, and this amount is being used only on calcareous soils for those with definite indications of chlorosis in the crop plants" (3).

This brings into focus the question, following applications of sulphur to non-acid soils, of the increased availability of the minor plant food elements precipitated by alkaline carbonates, and whose sulphate salts show a relatively high solubility in water, Table II. The voluminous literature on base exchange reactions in soils supports these considerations and it is unnecessary to cite more than a few research reports. McGeorge showed that applications of sulphur increased the availability of manganese and ameliorated the deficiency of that element for sugar cane and citrus (5), (6). He also states that the availability of copper and zinc are increased by applications of sulphur to alkaline soils,especially when the alkalinity is in part derived from calcium carbonate (*10*).

With reference to calcium and magnesium, the reciprocal repression of solubilities when appreciable quantities of these two elements are present in the soil is well known from the work of MacIntire and others, and the effects of sulphates and nitrates on the solubilities of these elements in soils has been shown (*12*). In Calcareous soils when sodium and potassium salts are not present in appreciable concentration, even calcium may be deficient in availability to crops. This has been observed in commercial practice under field conditions on the calcareous soils of the lower East Coast of Florida through the response of snap beans and other crops to calcium applied as the water-soluble salt of a strong acid, such as calcium nitrate or calcium chloride.

Non-Acid Soil Areas

Although the United States Soil Survey and state investigations indicate that most of the acreage of plowable soils west of the Mississippi River is non-acid, the detailed soil surveys have not progressed sufficiently to estimate the acreages at different pH levels. Most of the soil areas in Louisiana, Arkansas, East Texas, Missouri, Iowa and Minnesota are slightly acid. In the Dakotas, Nebraska, Kansas and Oklahoma most of the subsoils and a considerable part of the surface soils are calcareous. In the Rocky Mountain states and in the arid sections of California, Oregon and Washington there are large areas of alkali and calcareous soils. In general, soil pH correlates rather closely with the rainfall and its distribution. Acid soils occur where percolation takes place appreciably and annually. Calcareous subsoils occur in areas of approximately equal upward and downward movement of soil moisture. Alkali soils predominate in all areas of deficient annual rainfall with poor distribution. It is difficult to estimate by states the acreages of crop land at different pH levels. The relatively few replies received to questions 4, 5 and 6 in the questionnaire indicate the lack of such information.

Table IV shows the data received from nine states. It indicates a need for further and more definite survey work and informational investigation. It also indicates that the commercial promotion based on experimental results should be directed by experienced soil chemists, agronomists and horticulturists.

Expriemental Methods

In the states where experimental work has been conducted for several years, particularly

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in Oregon, California, Arizona, New Mexico and Texas, rates of application suitable to some of the local conditions have been ascertained. Of particular interest and promise is the method of partial acidulation of soils by localized spots or small areas as used in the Rio Grande Valley in Texas (*2*). Digging post holes to a depth of 2 or 3 feet, mixing the soil with sulphur and returning the mixture to the holes; or making holes with a pointed iron rod or crow-bar and filling them with sulphur at sufficient intervals to allow all plants access so the acidulated areas, is one way to obtain results practically and economically with a minimum of pounds sulphur per acre.

However, fertilizer experimentation in recent years has made great progress in methods of applying. Plow-sole application, which puts the fertilizer in a common sense way in the zone where moisture is most likely to be found throughout the growing season, indicates possibilities for sulphur on calcareous soils by increasing percolation through the impervious calcareous hardpan frequently found in such soils. Band applications at various soil depths should also be tried. It may be significant that, in some of the states reporting no returns of economic value from applications of sulphur to non-acid soils, the applications were small, usually less than 300 pounds sulphur per acre, and mostly were broadcast on the surface of the soil; a method somewhat discredited and discounted with reference to fertilizers in the heavy consuming states where the rainfall is more favorable both in amount and in distribution.

Experimentally the present status of sulphur in the western states, with reference to its use for soil acidulation, is: that sufficient economic benefits have been disclosed and demonstrated to justify a closely coordinated and more general and more comprehensive series of experiments in each state, that would utilize to the fullest extent the methods and information developed in the rate and method of application studies that have been conducted in states using large tonnages of commercial plant foods, and also take into ac-

TABLE IV

ALKALINE AND CALCAREOUS SOILS IN SOME WESTERN STATES

A. pH Range of Irrigated and Non-Irrigated Soils
B. pH Range of Cropped Alkaline Soils
C. Area or Per Cent Cropped Soils Calcareous in Surface or Subsoil

State	pH Range		Cropped Alkaline Soils		Cropped Calcareous Soils	
	Irrigated Soils	Non-Irrigated Soils	pH 7.0–8.0	above 8.0	Surface	Subsoil
Oregon	6.0–8.4	6.0–7.8	....	100,000 acres	.....	1,000,000 acres
Arizona	.....	.....	25%	75%	all	all
New Mexico	7.5–8.4	7.5	75%	25%	525,000 acres	525,000 acres
California	6.0–8.5	.....	....	....	.....	.....
Nebraska	6.5–8.5	5.5–8.5	....	....	.....	.....
Colorado	7.0–8.0	7.0–8.0	75%	15%	6,000,000 acres	3,000,000 acres
Washington	7.0–8.0	6.5–7.5	majority*	small %†	small %	40–48%
North Dakota	.....	.....	....	....	.....	100%
Kansas	7.0–7.5	5.0–8.0	15%	5%	8%	50%

*Central Washington only. †Eastern Washington only.

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count the soil amendment properties of sulphur already demonstrated.

Opportunities

Commercially, the tonnage of sulphur now used on both calcareous and alkali soils for a variety of crops is sufficient to warrant careful aggressive sales development work on similar soils and crops in additional areas; exercising due care to proceed only on the basis of factual information regarding methods and rates of applications and similarity of soil and climatic conditions. Regional conferences for discussion and exchange of information, a closer coordination of the research programs, and industry cooperation should result in a more economic crop production on calcareous and alkali soils from the use of larger tonnages of sulphur in western states. Sales programs should both utilize the marketing opportunities and observe the limitations as set by the experimental work.

Much if not most of the basic research has been done. Developmental research, experimentation and demonstration are needed. In this work, industry, if it would profit by its opportunities, should take an important part.

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James C. O'Neal of Shreveport, Louisiana, has been named Sales Representative of the Chemical Division of Lion Oil Company with the territory covering the states of Arkansas, Louisiana, Texas and Oklahoma. Mr. O'Neal for the past twenty-three years has been associated with the Virginia-Carolina Chemical Corporation and until recently was District Manager of that company for the same territory.

As Sales Representative for Lion Oil Company, Mr. O'Neal will continue to make his headquarters in Shreveport. In that capacity he will work with fertilizer manufacturers and mixers in the distribution of ammonium nitrate fertilizer.

Henry L. Taylor, for the past twenty-eight years actively connected with the fertilizer industry, has been named Special Sales Representative for the Chemical Division of Lion Oil Company and will for the present operate from the General Sales Headquarters of the company at El Dorado, Arkansas. During three and one-half years of the war, Mr. Taylor was associated with the War Production Board and in the last year of that connection served as Chief of the Nitrogen Unit in which capacity he handled allocation of all inorganic nitrogen to the United States, Hawaii and Porto Rico.

For the twenty-three years prior to his wartime experience in Washington, Mr. Taylor operated his own fertilizer brokerage business at Wilmington, N. C., and is widely known in the industry.

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Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
McIver & Son, Alex. M., Charleston. S. C.
Scar-Lipman & Co., Inc., New York City.

FOUNDERS AND MACHINISTS
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

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Utility Works, The, East Point, Ga.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Scar-Lipman & Co., Inc., New York City.

INSECTICIDES
American Agricultural Chemical Co., New York City.
McLaughlin GormleyKing Co., Minneapolis, Minn.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., Inc., New York City.

LOADERS—Car and Wagon
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making and Handling
Chemical Construction Corp., New York City.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

MACHINERY—Ammoniating
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Hough Co., The Frank G., Libertyville, Ill.
Hayward Company, The, New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

MACHINERY—Grinding and Pulverizing
Bradley Pulverizer Co., Allentown, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Sedberry, Inc. J. B., Franklin, Tenn. and Utica, N. Y.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

MACHINERY—Material Handling
Hayward Company, The, New York City.
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

MACHINERY—Mixing, Screening and Bagging
Exact Weight Scale Co., Columbus, Ohio
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

MACHINERY—Power Transmission
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Superphosphate Manufacturing
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.
Tennessee Corporation, Atlanta, Ga.

MIXERS
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, New York City.

NITRATE OF SODA—Continued
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., Inc., New York City.
Schmaltz, Jos. H., Chicago, Ill.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., Wilmington, Del.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., Inc., New York City.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Ruhm, H. D., Mount Pleasant, Tenn.
Scar-Lipman & Co., Inc., New York City.
Schmaltz, Jos. H., Chicago, Ill.
Virginia-Carolina Chemical Corp., Richmond, Va.

PLANT CONSTRUCTION—Fertilizer and Acid
Chemical Construction Corp., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Titlestad Corporation, Nicolay, New York City.
Utility Works, The, East Point, Ga.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Scar-Lipman & Co., Inc., New York City.
Schmaltz, Jos. H., Chicago, Ill.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City.
Potash Co. of America, New York City.
International Minerals & Chemical Corp., Chicago, Ill.
United States Potash Co., New York City.

PRINTING PRESSES—Bag
Schmutz Mfg. Co., Louisville, Ky.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.

REPAIR PARTS AND CASTINGS
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Utility Works, The, East Point, Ga.

ROUGH AMMONIATES
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., Inc., New York City.
Schmaltz, Jos. H., Chicago, Ill.

SCALES—Including Automatic Bagging
Exact Weight Scale Co., Columbus, Ohio
Sackett & Sons Co., The A. J., Baltimore, Md.
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Utility Works, The, East Point, Ga.

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SEPARATORS—Air
Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City.
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Bradley & Baker, New York City.
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Scar-Lipman & Co., Inc., New York City.
Schmaltz, Jos. H., Chicago, Ill.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.
Texas Gulf Sulphur Co., New York City.
Virginia-Carolina Chemicrl Corp., Richmond, Va.

SULPHURIC ACID
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Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., Inc., New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City.
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Ashcraft-Wilkinson Co., Atlanta, Ga.
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Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

TANKAGE
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Ashcraft-Wilkinson Co., Atlanta, Ga.
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Bradley & Baker, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Scar-Lipman & Co., Inc., New York City.
Schmaltz, Jos. H., Chicago, Ill.

UREA
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UREA-AMMONIA LIQUOR
DuPont de Nemours & Co., E. I., Wilmington, Del.

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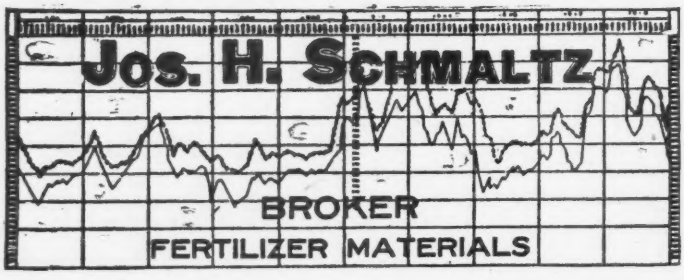

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